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PROTECTION OF THE QUALITY AND SUPPLY OF FRESHWATER RESOURCES: APPLICATION OF INTEGRATED APPROACHES TO THE DEVELOPMENT, MANAGEMENT AND USE OF WATER RESOURCES

Options for Agenda 21

Report of the Secretary-General of the Conference

I. INTRODUCTION

1. Effectively integrated management of water resources is important to all socio-economic sectors relying on water. Rational allocation prevents conflict and enhances the social development of local communities as well as economic planning and productivity. Efficient demand management allows water-using sectors to make long-term savings on water costs and stimulates resource-conscious production technologies. Health conditions and environmental quality should also improve either resulting from integrated development planning or as a beneficial consequence of improved environmental or social conditions.

2. The present report is based upon a review of progress in the implementation of the Mar del Plata Action Plan and resulting strategies for the 1990s. Organizations represented at the Intersecretariat Group for Water Resources of the United Nations Administrative Committee on Coordination (ACC) collaborated in this process.

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Linkages to other Environmental and Developmental Issues

3. Water is a finite resource, essential for the sustenance of life on earth. Virtually all the environmental issues listed in the United Nations General Assembly resolution 44/228 are directly or indirectly linked to freshwater issues. With increase in economic activities, and more exploitation of major ecosystems and natural resource stocks, the study of linkages between freshwater issues and other sectoral and cross-sectoral issues is becoming increasingly important. Socio-economic pursuit - including urbanization, industrial production and agricultural activities - has reached a stage where freshwater issues have often become the limiting factor for sustainable development. Freshwaters - rivers, reservoirs, lakes and ground waters - are in contact with other ecosystems and are used in a variety of human activities, many of which would not be possible without a freshwater supply of adequate quality and quantity.

4. Poor land-use planning, including deforestation, through agricultural development, mining and urbanization, could lead to a considerable increase in erosion problems and related soil loss in the river basins. The sedimentation in large reservoirs may have serious adverse effects downstream by reducing the quantity of natural nutrients available to agricultural land or to coastal waters. The loss of nutrients can lead to increased fertilizer use and decreases in coastal fishery yields. Acidification of surface and some ground waters due to atmospheric deposition of air pollutants can lead to depletion of freshwater living resources, contributing to the loss of biodiversity. Construction of dams for hydropower and irrigation, water channelization, over-abstraction from aquifers, use of water bodies as open sewers for discharge of both domestic and industrial wastes can lead to salinization of rivers, lakes, and soils, salt intrusions in coastal aquifers, and serious water pollution problems. Should a global warming occur as a result of climate change it is likely to affect the world's freshwater resources through changes in the hydrological cycle, resulting in the decrease of soil moisture and annual river runoff in many areas of the Northern Hemisphere.

5. Water-related diseases are still a major health problem, especially in the developing countries. Diseases caused by microbiological pollution of water supplies or transmitted by water-associated vectors, and those related to inadequate sanitation and absence of clean water, are widespread. With water use per capita expected to increase significantly in developing countries with high economic or population growth rates, the volume of waste requiring treatment is expected to present a growing problem. To ignore the interactions and linkages between freshwater issues and other sectoral issues could result in severe social, economic or human health consequences.

II. OPTIONS FOR AGENDA 21

PROGRAMME AREAS

6. In accordance with this review, the following six components were developed for the freshwater sector:

- Water Resources Assessment

- Protection of Water Quality

- Drinking Water Supply and Sanitation

- Water and Sustainable Urban Development

- Water for Sustainable Agricultural Development

- Integrated Water Resources Management

Each component is presented in this document in a format which covers the basis for action, objectives, and programme activities.

7. The action programmes described hereunder are mostly addressed to the national governments although many of the proposed programme activities have to be implemented at the local level. In addition, the external support agencies are expected to play an important role in the facilitation of the necessary national action plans.

8. Decision 2/20 of the Preparatory Committee of the United Nations Conference on Environment and Development requested the Secretary-General of the Conference to submit to the Preparatory Committee at its third session a report identifying the main elements of an action programme, including an implementation plan, which should be reviewed for use as a basis for Agenda 21. Options for action are presented hereunder whereas implementation mechanisms will be identified by the Dublin Conference on Water and the Environment.

A. WATER RESOURCES ASSESSMENT

Basis for action

9. Water resources assessment (WRA) is the continuing determination of sources, extent, dependability, and quality of water resources. It is the practical basis for their sustainable management and a prerequisite for evaluation of the possibilities for this development. There is, however, growing concern that at a time when more precise and reliable information is needed about water resources, hydrological services and related bodies are less able to provide this information, especially information on ground water and water quality. Major impediments are: the lack of financial resources for WRA, the fragmented nature of hydrological services and the insufficient numbers of qualified staff. At the same time the advancing technology for data capture and management is increasingly difficult to apply for developing countries. Establishment of national data bases is, however, vital to WRA and for mitigating floods and pollution.

Objectives

10. Based upon the Mar del Plata Action Plan, this programme area is extended into the 1990s and beyond with the overall objective:

> "To ensure the assessment and forecasting of the quantity and quality of water resources, in order to meet the needs of all sectors of society, to enable mitigation of water-related hazards, and to maintain or enhance the condition of the global environment."

Four specific objectives are set accordingly as follows:

a. to have all countries allocate to water resource assessment the financial resources which are justified by the economic and social value of information about their water resources;

b. to have all countries establish the institutional arrangements needed to ensure the efficient collection, processing, storage, retrieval and dissemination to users of information about the quality and quantity of available water resources in an integrated manner;

c. to make available to all countries water resource assessment technology which is appropriate to their needs, irrespective of their level of development;

d. to have sufficient numbers of appropriately qualified and capable staff recruited and retained by water resource assessment agencies, and provided with the training and retraining they need to carry out their responsibilities successfully.

11. Quantitative programme targets can be set for the number of countries covered with adequate services:

a. by the year 2000 there should be water resources assessment installed in 70 countries with high capability of services, and 60 countries with medium capability of services;

b. by the year 2025 there should be 110 countries with high capability of services, and 40 countries with medium capability of services;

c. the longer-term target is to have high capabilities of services available in all countries.

Activities

12. Governments, with the assistance of relevant UN agencies, regional and international organizations and donor agencies, and through bilateral and multilateral agreements, could undertake the following activities:

13. a. increasing financial resources for WRA

- securing augmented budgetary allocations
- exploring novel ways of funding
- estimating the economic and social value of water resources data to justify the investment in WRA.

b. improving institutional arrangements

- facilitating close collaboration between water sector agencies, particularly between information producers and users

- reviewing the legislative and regulatory basis of WRA

- preparing catalogues of the water resources information held by government services, private sector, educational institutes, consultants and others.

c. upgrading and increasing technology transfer

- encouraging international organizations and donors to meet the real needs of the country

- developing strategies for meeting requirements over the medium and long term.

d. capacity building for WRA

- encouraging the provision of attractive terms of employment and career paths for professional and technical staff

- monitoring human resources needs and meeting them through education and training opportunities, and international programmes of courses and conferences.

B. PROTECTION OF WATER QUALITY

Basis for action

14. There are few regions of the world that are still exempt from problems of degraded water quality and the pollution of surface and groundwater sources. The problem most affecting water quality in developing countries is the discharge of domestic sewage. In the rural areas, concern about the entry of fertilizers and pesticides into watercourses and groundwater aquifers is increasing. Aquatic ecosystems are disturbed and the living freshwater resources are threatened. Aquatic ecosystems are also affected by major water resource development projects such as large dams, river diversions and irrigation schemes. Land degradation and deforestation have led to increased erosion and sedimentation. Ecological and human health effects are the measurable consequences, although the means to monitor them are grossly inadequate or non-existent in many developing countries.

Objectives

15. Already the Mar del Plata Action Plan recognized the intrinsic linkage between water resource development projects and their important repercussions of a physical, chemical, biological and socio-economic nature. The overall environmental health objective was set:

> "to evaluate the consequences which the various users of water have on the environment, to support measures aimed at controlling water-related diseases, and to protect ecosystems".

16. Two objectives will have to be pursued concurrently to integrate water quality aspects into water resource management:

a. maintenance of ecosystem integrity/a management principle to preserve aquatic ecosystems, including the living resources, and to protect them effectively from direct and indirect pollution;

b. public health protection/a task requiring not only the provision of pathogen-free drinking water but also the control of disease vectors in the aquatic environment.

17. Two targets have been set to integrate water quality aspects into water resource managment:

a. by the year 2000 all newly industrializing countries should have effective water pollution control programmes in operation, commensurate with their socio-economic development;

b. by the year 2000 all countries should participate, as far as appropriate, in inter-country and international water quality monitoring and management programs such as the Global Water Quality Monitoring Programme GEMS/WATER, UNEP's Environmentally Sound Management of Inland Waters, FAO's regional inland fishery bodies, or the RAMSAR convention on wetlands;

c. by the year 2025 the prevalence of water-associated diseases should be drastically reduced, starting with the eradication of dracunculosis (Guinea worm) by the year 1995 and onchocerciasis (river blindness) by the year 2000.

Activities

18. All national governments, especially of developing countries, with the assistance of appropriate UN agencies and other international organizations, and in cooperation with the industrialised countries could embark upon the following activities:

a. application of clean technology

- control of industrial waste discharges, including low-waste production technologies and water recirculation

- treatment and safe reuse of waste-water in agriculture and aquaculture.

b. diffuse pollution source control

- rational land use to prevent land degradation, erosion and siltation

- controlled use of agrochemicals to prevent eutrophication and chemical contamination of ground waters.

c. water pollution control measures

- application of polluter pays principle to all kinds of sources
- introduction of precautionary principle in water quality management
- request for environmental impact assessment on all major water resource development projects.

d. legal instruments for water quality protection

- monitoring and control of transboundary pollution in shared water resources
- control of long-range atmospheric transport of pollutants
- control of accidental spills in international water bodies

e. capacity building for water quality management

- establishment of institutional framework at national and local levels
- development of technical infrastructure for water quality monitoring, assessment and control
- enhancement of staff capabilities at technical and managerial levels.

C. DRINKING WATER SUPPLY AND SANITATION

Basis for action

19. Safe water supplies and environmental sanitation are vital for protecting the environment, improving health and alleviating poverty. An estimated 80 per cent of all diseases and over one third of deaths in developing countries are caused through the consumption of contaminated water and on average as much as one tenth of each person's productive time is sacrificed to water-related diseases. Concerted efforts during the 1980s brought water and sanitation services to hundreds of millions of the world's poorest people. The most outstanding of these efforts is the launching in 1981 of the United Nations International Drinking Water Supply and Sanitation Decade (IDWSS) which resulted from the Mar del Plata Action Plan adopted by the United Nations Water Conference in 1977. The objective of the IDWSS was to provide safe drinking water and sanitation to underserved urban and rural areas by 1990. But even this unprecedented progress was not enough. One in three people in the developing world still lacks these two most basic requirements for health and dignity.

Objectives

20. The New Delhi Statement formalized the need to provide, on a sustainable basis, access to safe water in sufficient quantities and proper sanitation for all, requesting "some for all rather than more for some". Four Guiding Principles provide for the programme objectives:

a. protection of the environment and safeguarding of health through the integrated management of water resources and liquid and solid wastes;

b. institutional reforms promoting an integrated approach and including changes in procedures, attitudes and behaviour, and the full participation of women at all levels in sector institutions;

c. community management of services, backed by measures to strengthen local institutions in implementing and sustaining water and sanitation programmes;

d. sound financial practices, achieved through better management of existing assets, and widespread use of appropriate technologies.

21. Past experience has shown that specific targets should be set by each individual country. At the Summit for Children in 1990, 71 heads of state or government called for both universal access to water supply and sanitation and the eradication of guinea worm disease by 1995. Even for the more realistic target to achieve full coverage in water supply by 2025, it is estimated that annual investments must reach double current levels. The only realistic strategy to meeting present and future needs, therefore, is to develop lower cost services that can be implemented and sustained at the community level.

Activities

22. All national governments, especially of developing countries, with the assistance of appropriate UN agencies and other international organizations, and in cooperation with the industrialised countries could embark upon the following activities:

a. the environment and health

- sanitary disposal of excreta and sewage
- expansion of urban water supply, sewage and drainage systems
- control of water-associated diseases
- treatment and reuse of domestic wastewaters

b. people and institutions

- changing the role of government towards decentralization, local authorities, private enterprises and NGOs
- human resources development at all levels, including special programmes for women
- broad-based education programmes, with particular emphasis on hygiene and local management

c. community management

- support to communities in owning and control of their own systems on a sustainable basis

- encouragement of women in water management

- linkages between national water plans and community management of local waters

d. finance and technology

- making service-agencies more cost-effective and responsive to consumer needs

- restructuring the utilization of funds with more attention to underserved rural and low-income urban areas

- rehabilitation of defective systems, reduction of wastage and reuse of water and wastewater

- programmes for operation and maintenance on the basis of cost recovery and charging mechanisms

- research and development of appropriate technical solutions.

D. WATER AND SUSTAINABLE URBAN DEVELOPMENT

Basis for action

23. Early in the next century, more than half of the world's population will be living in urban areas. By 2025 that proportion will have risen to 60%, some 5 billion people. Rapid urban population growth and industrialization are putting severe strains on the water resources and environmental protection capabilities of many cities. Scarcity of freshwater resources and the escalating costs of developing new resources have a considerable impact on national industrial development and economic growth. Better management of urban water resources can make a substantial contribution to the alleviation of poverty and improvement of the health and quality of life of the urban poor. A high proportion of urban agglomerations are located on estuaries and in coastal zones. The resulting pollution from municipal and industrial discharges combined with overexploitation of available water resources contaminates the marine environment and threatens future supplies.

Objectives

24. The development objective of this programme is to support local and central governments' efforts and capacities to sustain national development and productivity through environmentally sound management of water resources for urban use. Supporting this objective is the identification and implementation of strategies and actions to ensure the continued supply of affordable water for present and future needs, and to reverse current trends of resource degradation and depletion.

25. The following targets have been set:

By the year 2000:

a. All urban residents have access to at least 40 litres per capita and day of safe water and 75% are provided with acceptable means of sanitation.

b. All countries establish and apply quantitative and qualitative discharge standards for municipal and industrial effluents.

c. 75% of solid waste generated in urban areas is collected and disposed of in an environmentally safe way.

By the year 2025:

e. All countries have established biological and chemical quality criteria for all water bodies (surface and groundwater).

f. Biological and chemical quality of water bodies is demonstrating steady improvement.

Activities

26. Countries, through regional and international cooperation, and with the support of NGOs and the private sector, could undertake the following activities:

a. protection of water resources from depletion and degradation

- introduction of sanitary waste disposal facilities based on low-cost upgradable technologies
- implementation of urban storm water runoff and drainage programmes
- promotion of recycling and reuse of waste-water and solid wastes.

b. efficient and equitable allocation of water resources

- reconciliation of city development planning with the availability and sustainability of water resources
- introduction of water tariffs which reflect the marginal and opportunity cost of water
- initiation of public awareness campaigns to promote conservation and reuse.

c. institutional(legal)management reforms

- adoption of a city-wide approach to the management of water resources

- incorporation into municipal agencies plans of land and water management, housing and other urban development programmes

- utilization of the skills and potential of non-governmental organizations and the private sector

d. support to local capacity building

- promotion of investments in urban water and waste management reflecting the major contribution of cities to national economic development

- provision of seed money and technical support to the local handling of materials supply and services

- encouragement of autonomy and financial viability of city water and sewerage utilities

- creation and maintenance of a cadre of professionals and semi-professionals for water, wastewater and solid waste management.

E. WATER FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT

Basis for action

27. Sustainability of agricultural production will increasingly depend on sound and efficient water use and conservation practices consisting primarily of irrigation development and management including water management in rainfed areas, inland fisheries and agro-forestry. While significant expansion of the area under rainfed agriculture has been achieved during the past decade, the productivity response and sustainability of irrigation systems have been constrained by problems of water-logging and salinization. Soil erosion in the upper watersheds, mismanagement and over-exploitation of the natural resources in the drought-prone areas and acute competition for water, have all influenced the extent of poverty, hunger and famine in the developing nations.

Objectives

28. An International Action Programme on Water and Sustainable Agricultural Development (IAP-WASAD) has been initiated by FAO in cooperation with other international organizations. The main objective of the IAP-WASAD is to assist developing countries in planning, developing and managing water resources on an integrated basis to meet the present and future needs for agricultural production.

29. The IAP-WASAD has developed a framework for sustainable water use in the agricultural sector and identified priority areas for action at national, regional and global levels. Quantitative targets for new irrigation development, improvement of existing irrigation schemes and reclamation of waterlogged and salinized lands through drainage for 94 developing countries are estimated on the basis of food requirements, agro-climatic zones and availability of water and land.

30. The following projections are given:

By the year 2000:

a. 21 million hectares of new irrigation development

b. 17 million hectares of improvement/modernization of existing schemes

c. 10 million hectares installed with drainage and water control facilities

d. 15 million hectares of small-scale irrigation water programmes and conservation.

Activities

31. Countries, especially developing countries, with the cooperation of the private sector and NGOs, could undertake the following activities to protect their water resources from depletion and degradation:

a. water use efficiency

- increase of efficiency in agricultural water use for better utilization of limited water resources

- strengthening of water and soil management research under irrigation and rainfed conditions

- monitoring and evaluation of irrigation project performance

b. waterlogging, salinity control and drainage

- introduction of surface drainage in rainfed agriculture to prevent temporary waterlogging and flooding of lowlands

- introduction of artificial drainage in irrigated agriculture

- encouragement of conjunctive use of surface and groundwaters, including monitoring and water balance studies

c. water quality management

- establishment and operation of cost-effective water quality monitoring systems for agricultural water uses

- prevention of adverse effects of agricultural activities on water quality for other uses

d. small-scale water programmes

- development of small-scale irrigation, water supply for humans and livestock and for water and soil conservation

- promotion of local initiatives for the integrated development and management of water resources

- provision of adequate technical advice and support and enhancement of institutional collaboration at the local community level

e. scarce water resources management

- development of long-term strategies and practical implementation programmes for agricultural water use under scarcity conditions with competing demands for water

- formulation of specialized programmes focused on drought preparedness with emphasis on food scarcity, environmental safeguards and community resilience

f. supporting capacity building

- development of adequate data bases and adaptive research

- institutional strengthening based upon human resources development at all levels

- transfer of existing water use technologies and support of their field application.

F. INTEGRATED WATER RESOURCES MANAGEMENT

Basis for action

32. The extent to which water resources development contributes to economic productivity and social well being is not usually appreciated although all social and economic activities rely heavily on the supply and quality of fresh water. As populations and economic activities grow many countries are rapidly reaching conditions of water scarcity or face limits to economic development. Water demands are increasing rapidly, with 70-80% for irrigation, less than 20% for industry and a mere 6% for domestic consumption. The holistic management of water as a finite and vulnerable resource, and the integration of sectoral water plans and programmes within the framework of national economic and social policy is of paramount importance for action in the 1990s and beyond. The fragmentation of responsibilities for water resources development among sectoral agencies is proving, however, to be an even greater impediment to promoting integrated water management than had been anticipated.

Objectives

33. Integrated water resources management is based on water as a natural resource and an economic good. In developing and using water resources, priority has to be given to the satisfaction of basic needs. Beyond basic needs, however, water users should be charged its true marginal costs.

34. Integrated water resources management should follow four principal objectives:

a. to promote a dynamic, interactive, iterative and multisectoral approach to water resources management which integrates technological, economic, environmental and social considerations

b. to plan the rational utilization, conservation and management of water resources based on community needs and priorities and within the framework of national economic development policy

c. to design, implement and evaluate projects and programmes which are both economically efficient and socially appropriate within clearly defined strategies, based on a full public participatory approach

d. to develop the appropriate institutional, legal and financial mechanisms to ensure that water resources development is a catalyst for sustainable social progress and economic growth.

35. The strengthening of national capacities to manage the resource and the role of government in creating the enabling environment for efficient and equitable utilization of the resource are crucial. In the case of transboundary water resources there is an even greater need to formulate and harmonize water resources strategies and action programmes.

36. Although difficult to measure success in this area, quantitative targets could realistically be set as follows:

By the year 2000:

a. all developing countries will have designed and initiated costed and targeted national action programmes, and 75% of all countries will have appropriate institutional and legal structures in place.

By the year 2025:

b. subsectoral programme targets reached.

Activities

37. Countries, especially developing countries, with the assistance of relevant UN bodies and international donors, could implement the following activities to improve integrated water resources management in their countries:

a. development of interactive databases, forecasting methods and economic planning models

b. optimisation of water resources allocation under physical and socio-economic constraints

c. formulation of costed and targeted national action plans and investment programmes

d. capacity building, including the rationalization and strengthening of institutional and legal structures and the development of the necessary human resources basis

e. Implementation of allocation decisions through demand management, pricing mechanisms and regulatory measures

f. flood and drought management using risk analysis and social impact assessment

g. development of public participatory techniques and their implementation in decision making

h. enhancement of the role of women in water resources planning and management.